UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
PSC Box 20041
Camp Lejeune, North Carolina 28542-0041

AIM 5104

STUDENT OUTLINE

REBUILD WINCH ASSEMBLY

LEARNING OBJECTIVES

1. Terminal Learning Objective: Provided with faulty winches, required tools, replacement parts, shop supplies, cleaning materials, and references, rebuild the winches, per current serviceability standards and references. (3522.01.08)

2. Enabling Learning Objectives:

a. Provided with faulty HMMwV winch, required tools, replacement parts, shop supplies, cleaning materials, and TM 9-2320-280-34, disassemble the winches, per current serviceability standards and reference. (3522.01.08a)

b. Provided with faulty HMMwV winch, required tools, replacement parts, shop supplies, cleaning materials, and TM 9-2320-280-34, inspect the winch components for serviceability, per current serviceability standards and reference. (3522.01.08b)

c. Provided with faulty HMMwV winch, required tools, replacement parts, shop supplies, cleaning materials, and TM 9-2320-280-34, replace the unserviceable components, per current serviceability standards and reference. (3522.01.08c)

d. Provided with faulty HMMwV winch, required tools, replacement parts, shop supplies, cleaning materials, and TM 9-2320-280-34, assemble the winch, per current serviceability standards and reference. (3522.01.08d)

OUTLINE

1. DESIGN CHARACTERISTICS AND PRINCIPLES OF OPERATION

a. Six models of the M998 Series vehicles are equipped with an electric powered, front mounted winch.

(1) The winch has a maximum capacity of 6000 pounds and is powered by the vehicle 24-volt electrical system.

(2) The winch is equipped with an electronic current limiter switch to prevent winch overloads. If an overload condition occurs, the winch will stop repeatedly during operation and then restart after a period of approximately five seconds.

(3) The winch is also equipped with a thermal cutoff switch to prevent the winch from overheating. If the winch becomes overheated, the winch will stop operation. After a wait of approximately two minutes, the thermal switch will reset and operation can resume.

b. Power is transmitted from the electric motor to the winch drum through a splined coupling, brake assembly, drive shaft and a three-stage planetary gear system.

(1) The winch is controlled by a hand-held remote control switch and a clutch lever that either engages the clutch or disengages it for free-spool operation.

(2) The brake assembly is designed to hold the winch drum in the locked position in the event of a power failure or if the motor is stopped for any reason while the clutch is engaged.

(3) The planetary gear system provides gear reduction which increases torque to the winch drum.

2. REPAIR PROCEDURES FOR THE M998 SERIES VEHICLE WINCH

a. Disassembly

(1) Remove two screws and two clamps that secure the electrical leads to the drum support.

(2) Remove the three screws securing the control cover, then remove the cover.

(3) Remove the nut securing lead 6C to the control. If the winch has the proper plastic coating, it will be necessary to remove the plastic coating before you can disassemble and inspect the winch properly.

(4) Remove the capscrew and lockwasher securing lead 7C to the motor.

(5) Disconnect the motor connector from the control connector.

(6) Remove the three nuts securing the control leads to the motor and disconnect the leads.

(7) Remove the vent tube fitting from the motor. This is removed so new sealant can be applied during assembly.

(8) Loosen the clamp and remove the control from the motor, then remove the clamp.

(9) Mark the drum support and motor for assembly and remove the ten socket head screws securing the motor to the drum support. Remove the motor, gasket, and coupling from the drum support, then remove the coupling from the motor.

(10) Mark the drum support, ring gear, and end housing. Remove the screws, then remove the end housing.

(11) Remove the ring gear and gasket from the end housing.

(12) Remove the stage three gear carrier and thrust bushing from the end housing.

(13) Remove the set screw, spring, and ball from the end housing. The clutch lever and O-ring seal can now be removed from the housing.

(14) Remove the stage two gear carrier, stage one gear carrier, stage one sun gear, and the clutch ring gear from the end housing. Notice the groove in the clutch ring gear. This is where the clutch lever fits.

(15) Remove the splined drive and retaining ring from the drive shaft, then remove the retaining ring from the splined drive.

(16) Remove the three locknuts securing the drum support to the three tie rods. Remove the drum support and thrust bushing from the drum.

(17) Remove the drum and second thrust bushing from the remaining drum support then push the drive shaft and brake assembly out of the drum.

(18) Remove the remaining three locknuts securing the other ends of the tie rods to the drum support and remove the tie rods. This completes the disassembly of the winch.

b. Cleaning. Cleaning of all components except the brake assembly will be in accordance with the general cleaning instructions located in paragraph 2-13 of the TM. **DO NOT CLEAN THE BRAKE ASSEMBLY.**

(1) Clean all parts, except the brake assembly, before inspection, after repair, and before assembly. **DO NOT CLEAN THE BRAKE ASSEMBLY OR DAMAGE TO EQUIPMENT MAY RESULT.**

(2) After cleaning, all parts must be covered or wrapped in plastic or paper to protect them from dust and dirt, if they aren't assembled immediately.

(3) Use cleaning solvent to clean all inner and outer casting surfaces and all areas subject to grease and oil.

(a) Use a stiff brush to remove sludge and gum deposits.

(b) Use compressed air to blow out all tapped capscrew holes and to dry the castings after cleaning.

(4) Clean all electrical components with a clean cloth dampened with dry cleaning solvent.

(a) Use care not to damage the protective insulation.

(b) Use compressed air to dry the electrical components.

c. Inspection: Follow the general inspection instructions outlined in paragraph 2-14 of the TM. Replace all unserviceable components.

(1) Inspect Castings.

(a) Inspect all ferrous and nonferrous castings for cracks. Particularly check around studs, threaded inserts, and sharp corners.

(b) Inspect machined surfaces for nicks, burrs, and raised metal.

(c) Inspect all capscrews and capscrew openings for damage and stripped threads.

(d) Use a straightedge or surface plate to check all gasket mating surfaces, flanges on housings, and supports for warpage.

(2) Machined Parts.

(a) Check machined parts for cracks, distortion, and damage.

(b) Check surfaces for nicks, burrs, and raised metal.

(3) Inspect all studs, bolts, capscrews, and nuts. Replace if they are bent, loose, stretched, or if the threads are damaged.

(4) Inspect the gears. When gear teeth wear limits are not established, good judgment is required to determine if gear replacement is necessary.

(a) Inspect all gears for cracks and missing teeth. Replace the gears if they are cracked or have missing teeth.

(b) Inspect the gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.

(c) Inspect the splines for wear, burrs, and galled or pitted surfaces.

(5) Inspect oil seals. The general instructions in the manual instruct us to replace all oil seals. The specifications for this winch instruct us to replace the seals if they are damaged. To be on the safe side, replace all seals, gaskets, and O-rings.

(6) Inspect the drum for damage to the splined end, flanges, and tube.

(7) Inspect the drum supports for damage.

(8) Remove the bushings and seals from both drum supports and inspect the sealing surfaces. If they are damaged, replace the drum support.

(9) If the drum support is not damaged, install a new seal. Inspect the bushings. If they are damaged, replace them; if they are not damaged, install them.

(10) Inspect the end housing for damage.

(11) Inspect the end housing bushing for damage or wear. Replace it if it is damaged or worn. If the bushing is to be reused, lubricate it with bushing grease.

(12) Inspect the gear teeth, splines, and machined surfaces of the clutch ring gear, sun gear, three gear carriers, ring gear, and the splined drive for damage.

(13) Inspect the drive shaft for damage.

(14) Inspect the tie rods for damage.

(15) Inspect the clutch lever and plastic cap for damage.

(16) Inspect the thrust bushings for damage.

(17) Inspect the friction rings and drive cam on the brake assembly. Replace the brake assembly if they are damaged.

(18) Inspect the brake assembly for other damage. Check the one-way clutch for proper operation.

(19) Inspect the motor splines, mating surfaces, and terminals for damage. Replace the motor if they are damaged.

(20) Inspect the drive coupling for damage.

(21) Inspect the control cover for damage.

(22) Inspect the control for damaged leads, breaks in the plastic coating, and damaged mounting base. Repair the plastic coating if it is broken. Replace the control if other damage exists.

d. Assembly. During assembly of the winch, all fasteners will be tightened to the specific or general torque specifications listed in the TM.

(1) Install the three tie rods into the drum support and secure them with the three locknuts.

(2) Install the drive shaft into the brake assembly and apply aircraft grease to the brake assembly.

(3) While holding the drive shaft, rotate the brake assembly to compress it for installation and install it in the drum.

(4) Apply aircraft grease to the thrust bushing and install the thrust bushing and drum on the drum support.

(5) Install the retaining ring onto the spline drive, then install them both in the drum.

(6) Apply aircraft grease to the remaining drum thrust bushing. Install the thrust bushing and drum support on the drum and secure the tie rods with three locknuts. Torque the locknuts to specifications.

(7) Install the clutch ring gear into the end housing, with the pointed ends of the gear teeth facing in.

(8) Install a new O-ring seal on the clutch lever and apply aircraft grease to the unpainted surface of the clutch lever.

(9) Aline the groove in the clutch ring gear with the hole in the end housing and install the clutch lever into the end housing.

(10) Install the ball, spring, and set screw into the end housing. Tighten the set screw until it is flush with the housing. DO NOT tighten the set screw beyond the point where it is flush with the housing or it may damage the winch.

(11) Apply aircraft grease to the stage one sun gear, stage one gear carrier, and the stage two gear carrier and install them in the end housing.

(12) Apply aircraft grease to the thrust bushing and install it into the end housing, flat side down. Apply aircraft grease to the stage three gear carrier and install it in the end housing.

(13) Install the gasket and ring gear on the end housing.

(14) Install the end housing, ring gear and gasket on the drum support. Be sure to aline the reference marks made during disassembly and install the ten socket head screws. Using a hex head driver, tighten the screws to specifications.

(15) Assemble the gasket and coupling on the motor and install them on the drum support, being sure to aline the reference marks made during the disassembly.

(16) Secure the motor to the drum support with the ten socket head screws. Using a hex head driver, torque the screws to specifications.

(17) If the motor or control has been pre-coated with sealing compound, remove the compound from between the motor case and the control mounting gear contact area. Failure to do this may cause poor grounding of the control.

(18) Install the control and clamp on the motor.

(19) Connect the three control leads to the terminals on the motor and secure them with the three nuts.

(20) Apply pipe sealant to the threads of the vent tube fitting and install the fitting.

(21) Secure the control to the motor with the clamp.

(22) Connect the control connector to the motor connector.

(23) Position lead 6C to aline with the opening in the cover, connect the lead to the control, and secure it with a nut.

(24) Connect lead 7C to the motor and secure it with a lockwasher and capscrew.

(25) Coat the motor end of the winch up to the drum support with coating compound.

(26) Secure leads 6C and 7C to the drum supports with two clamps and two capscrews.

(27) Install the cover on the control and secure it with three screws. This completes the assembly procedures.

REFERENCE:

TM 9-2320-280-34